

REMARKS

As a preliminary matter, Applicants request the Examiner to acknowledge and consider the references cited in the Information Disclosure Statement dated April 18, 2003. The Information Disclosure Statement complies with 37 C.F.R. § 1.98(b) because each cited reference that the Applicants asked the Examiner to consider was properly identified and included in the April 18 submission.

Reconsideration and allowance of this application are respectfully requested. Claims 1-183 are pending in this application. Claims 1-36, 45-59, 61, 73-87, 118, 129, 132-183 were previously withdrawn from consideration. Claims 37-44, 60, 62-72, 88-117, 119-128, 130, and 131 stand rejected. Claims 37, 62, 88, 99, 112, and 121 have been amended. The rejections are respectfully submitted to be obviated in view of the remarks presented herein.

35 U.S.C. § 102(b)

Claims 37-44, 60, 62-65, 68-71, 88-102, 105-117, 119-124, 127, 128, 130 and 131 stand rejected under 35 U.S.C. 102(b) as allegedly being anticipated by U.S. Patent No. 5,569,958 to Bloom (“Bloom”). Applicants respectfully traverse the rejection and request reconsideration in light of the following remarks.

Applicants’ invention relates to sources of releasable hydrogen within a hermetically sealed enclosure. Independent claim 37, for example, defines a semiconductor package comprising, *inter alia*, a hermetically sealed enclosure, a semiconductor chip, a first gas, “and a thin layer deposited over at least part of said semiconductor chip

comprising a source of releasable hydrogen within said enclosure, said releasable hydrogen capable of pressurizing the space within said enclosure to a pressure above the pressure associated with said first gas.” Bloom does not disclose every limitation recited by independent claim 37, therefore, Bloom does not anticipate the Applicants’ invention.

Bloom discloses “electrically conductive, hermetic vias which provide electrical pathways through generally dielectric ceramic substrates,” and via fill compositions “having sufficient malleability, [so that] the fill compositions are able to deform to relieve material stresses.” (Abstract and Col. 4, lines 56-58). For instance, Bloom discloses “an electronic component base with a via fill composition that is capable of deforming to accommodate dimensional changes in both the base and fill composition without loss of hermeticity, which occur as a result of heating to elevated temperatures,” and that “this composition includes an effective amount of an appropriate metal, up to about 10% of at least one active agent and an organic vehicle.” (Col. 2, lines 16-23). The active agents described by Bloom can include hydrides (Col. 5, lines 36-49). In the example relied upon by the Examiner, Bloom discloses a “silver-based fill composition” in which the active agent is “1% titanium hydride” (Col. 8, lines 21-39).

Bloom does not, however, disclose “a thin layer deposited over at least part of said semiconductor chip comprising a source of releasable hydrogen, said releasable hydrogen capable of pressurizing the space within said enclosure” as recited by independent claim 37.

First, Bloom does not teach “a thin layer deposited over at least part of said semiconductor chip comprising a source of releasable hydrogen.” Bloom discloses a “via fill composition. . . formed by combining the powdered metal(s) and active agent(s) with the organic vehicle and mixing until a pasty consistency is obtained. (Col. 6, lines 12-14). Bloom teaches filling the via holes “with the via fill composition by drawing the paste-like composition into the via hole” and by pressing the composition “into the via holes. . . until the composition exits the via hole on the other side.” (Col 6, lines 37-64). Bloom does not form a “thin layer with this fill composition, instead, he explains that “the amount of via fill composition “should be an amount such that a small mound or dome is formed above the via opening.” (Col. 6, lines 53-54). For whatever Bloom teaches about using a hydride in his composition, he does not disclose depositing “a thin layer . . . comprising a source of releasable hydrogen.”

Next, it is clear from Bloom’s disclosure that the active agent is used to facilitate the preparation of a malleable fill composition, not to release an amount of hydrogen “capable of pressurizing the space within said enclosure to a pressure above the pressure associated with said first gas,” as recited by claim 37. In fact, Bloom discloses that “[i]t is generally preferred to utilize relatively small particles of the active agent to promote dispersion of the agent throughout the via fill composition. The via fill compositions are generally formed by combining the powdered metal(s) and active agent(s) with the organic vehicle and mixing until a pasty consistency is obtained.” (Col. 6, lines 10-15). See also Col. 5, lines 41-44, where the active agent is described in the context of soldering and brazing. (“Two informative works on active agents are, ‘Principles of Soldering and

Brazing', Humpston, G. and Jacobson, D., ASM Int., page 164, 1993; and 'Brazing', Schwartz, M., ASM Int., page 120, 1987, which are herein incorporated by reference."). The Bloom active agent is not a source of generating hydrogen gas, and therefore, Bloom does not anticipate Applicants' invention.

Claims 38-44 and 60 are dependent upon claim 37. Applicants respectfully submit that these claims are allowable along with claim 37, for at least the reasons set forth above and on their own merits.

Independent claim 88 is similarly allowable. For example, claim 88 recites in pertinent part "a thin layer deposited over at least part of said semiconductor chip comprising a source of releasable hydrogen within said enclosure, said releasable hydrogen capable of pressurizing the space within said enclosure to a pressure above the first pressure." As set forth above, Bloom does not disclose this claimed element, thus, Bloom fails to anticipate the claimed invention.

Further, claims 89-98 depend from claim 88, and are allowable along with the base claim, for at least these reasons and on their own merits.

Independent claim 112 is similarly allowable. Bloom does not disclose "a source of releasable hydrogen within said enclosure, said source of releasable hydrogen capable of releasing hydrogen for pressurizing the space within said enclosure to a pressure above the first pressure." as recited by claim 112. Bloom does not disclose hydrogen released into an enclosure. Despite mentioning hydrides as an example of an active agent in his via fill composition, Bloom explains that "[n]early any active agent, including materials which

decompose upon firing to yield the desired active agent, may be utilized in the via fill compositions described herein. . . . Particular examples of the active agents which may be used include but are not limited to titanium, hafnium, zirconium and corresponding hydrides.” (Col. 5, lines38-46). It is clear from this broad array of examples that Bloom is not using the active agent for releasing hydrogen. Furthermore, nowhere in Bloom is the release of hydrogen gas for pressurizing the enclosure discussed. Because Bloom does not disclose, teach, or even suggest the element “a source of releasable hydrogen within said enclosure, said source of releasable hydrogen capable of releasing hydrogen for pressurizing the space within said enclosure to a pressure above the first pressure,” Bloom does not anticipate the Applicants’ invention.

Further, claims 113-120 depend from claim 112 and are therefore allowable along with the base claim for at least these reasons and on their own merits.

Independent claims 62, 99, and 121 are also allowable. Each of these claims recites “a heat-activated source of releasable hydrogen within said enclosure; and a gas at an elevated pressure. . . said gas comprising a first gas component and a second gas component, wherein said second gas component results from the release of said releasable hydrogen upon application of heat, and wherein said first gas component is initially present within said enclosure prior to the release of said releasable hydrogen, and said first gas component is initially present at a pressure lower than said elevated pressure.” Bloom does not disclose the claimed elements recited by these claims, thus Bloom does not anticipate the claimed invention.

As discussed above, Applicants maintain that Bloom does not teach the release of hydrogen within an enclosure. More specifically, Bloom does not teach a “heat-activated source of releasable hydrogen.” Bloom discusses the “firing” of a via fill composition in an oxygen free environment (Col. 6, lines 66-67), but Bloom does not teach heat as a catalyst for the release of hydrogen as in Applicants’ invention. Likewise, Bloom does not teach a heat source for “heating the source of releasable hydrogen so as to effect the release of hydrogen” as recited in dependent claims 107, 119, and 130. The Examiner asserts that 24 and 25 of Bloom’s figures represent heat sources; but in fact, these numerals represent circuit traces which are electrical connections between the vias 30 and the bond pad 40 (Col. 3, line 67 thru Col. 4, line 4), not a means of applying heat to a source of releasable hydrogen “so as to effect the release of hydrogen,” as in Applicants’ invention.

For whatever Bloom discloses about heating his enclosure, Bloom does not teach “the release of said releasable hydrogen upon application of heat.” Because Bloom does not teach every element recited by independent claims 62, 99, and 121, Bloom does not anticipate the Applicants’ invention.

Claims 63-65, 68-71, 100-102, 105-111, 122-124, 127-128, and 130-131 depend from claims 62, 99, and 121 and are therefore allowable along with the base claims for at least the reasons set forth above and on their own merits.

35 U.S.C. § 103(a) Bloom and Han

Claims 66, 67, 103, 104, 125 and 126 stand rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Bloom in view of U.S. Patent No. 6,281,135 to Han et al. (“Han”). For at least the following reasons, each of these rejections is respectfully traversed.

Claims 66 and 67 depend from claim 62; claims 103 and 104 depend from claim 99; and claims 125 and 126 depend from claim 121. As such, they each recite “a hermetically sealed enclosure. . . [and] a heat-activated source of releasable hydrogen within said enclosure. . . .” As set forth above, Bloom fails to teach this limitation. Further, there is no suggestion or motivation, either in the references or in the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings as necessary to attain the claimed invention.

The Office Action relies upon Han for its purported teachings related to limitations such as Applicants’ claimed gas composition. Regardless of any such teachings, Han does not rectify the deficiency associated with Bloom, i.e., the failure to anticipate Applicants’ claimed structure having, *inter alia*, “a heat-activated source of releasable hydrogen within said enclosure.” Thus, the asserted combination of disclosures would not have rendered obvious the embodiments of the invention defined by any of the rejected claims.

Further, although the Office Action argues that “[t]he ordinary artisan would have been motivated to modify Bloom. . . [with Han] for at least the purpose of providing

safety,” the Applicants’ respectfully disagree. Han teaches “stripping photoresist and/or removing post etch residues from an exposed low k dielectric layer of a semiconductor wafer.” (Abstract). More specifically, the Examiner cites a passage disclosing “a non-load locked plasma chamber configuration, the hydrogen gas ranges in an amount from about 3 percent to about 5 percent by volume of the forming gas for safety considerations” (Col. 3, lines 64-66). Han’s “forming gas” is a hydrogen/nitrogen mixture that forms a plasma gas used in etching and removing photoresist from etched wafers. Thus, it is unclear how or why Han’s gas mixture would be added to Bloom’s “electrically conductive, hermetic vias which provide electrical pathways through generally dielectric ceramic substrates” for the purpose of “providing safety” as the Office Action suggests.

Furthermore, Han is in an unrelated field of art and attempts to solve a different problem than the Applicants’ invention does. Thus, Han is a nonanalogous art reference that is inapplicable for a § 103 rejection. As M.P.E.P. § 2141.01 states, “In order to rely on a reference as a basis for rejection of an applicant’s invention, the reference must either be in the field of applicant’s endeavor or, if not, then be reasonably pertinent to the particular problem with which the invention was concerned.”

Because the combination of references does not teach or suggest each limitation of the claimed invention, and further, because there is no suggestion or motivation to combine or modify the cited references as required to support a *prima facie* case of obviousness, the Applicants respectfully request allowance of claims 66, 67, 103, 104, 125 and 126.

35 U.S.C. § 103(a) Bloom and Polak

Claim 72 stands rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Bloom in view of U.S. Patent No. 5,689,089 to Polak et al. ("Polak"). This rejection is respectfully traversed and reconsideration is requested for at least the following reasons.

Claim 72 depends from claim 62. As such, it recites "a hermetically sealed enclosure. . . [and] a heat-activated source of releasable hydrogen within said enclosure." As set forth above, Bloom fails to teach this limitation.

The Office Action relies upon Polak for its purported teachings related to limitations such as Applicants' claimed gas pressures. Regardless of any such teachings, Polak does not rectify the deficiency associated with Bloom, i.e., the failure to anticipate Applicants' claimed structure having, *inter alia*, "a heat-activated source of releasable hydrogen within said enclosure. . . [and a] gas comprising a first gas component and a second gas component, wherein said second gas component results from the release of said releasable hydrogen upon application of heat." The asserted combination of disclosures would not have rendered obvious the embodiments of the claimed invention because the combination still does not teach or suggest every claim limitation recited by claim 72.

Further, there is no "suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings," as necessary to attain the Applicants' invention. See M.P.E.P. § 2143. The Examiner asserts that "[t]he ordinary

artisan would have been motivated to modify Bloom in the manner described above for at least the purpose of preventing the power steering fluid from diffusing through bond pad platform.” (Office Action, p. 9) This statement shows, however, how different the Polak reference is from either the Applicants’ invention or even from Bloom. Bloom does not mention “power steering fluid,” thus, it is unclear why an ordinary artisan would want to modify Bloom to prevent the diffusion of such power steering fluid.

Because the combination of references does not teach or suggest each limitation of the claimed invention nor produce a suggestion or motivation to modify or combine the references so as to attain the Applicants’ invention, the Applicants respectfully request allowance of claim 72.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

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Respectfully submitted,

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